

This Week's Citation Classic

Hillman W S. The physiology of phytochrome. *Annu. Rev. Plant Physiol.* 18:301-24, 1967. [Biology Dept., Brookhaven National Lab., Upton, NY]

The chromoprotein phytochrome almost certainly mediates the profound effects of red and far-red light on plant development, but gross spectrophotometric measurements of phytochrome content, state, and transformations often fail to correlate intelligibly with physiological data. [The SCI® indicates that this paper has been cited over 170 times since 1967.]

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"I've never believed in frequent citation as an even remotely valid index of a paper's value. Until now, that is: *nunc, credo!*

"Only the first sentence above is true, but it's nice to be able to write it without sounding like the fox in the vineyard. And, obviously, a letter saying you've been responsible for something that is in any favorable sense a 'classic' is a lot more fun than most of the daily mail.

"I wrote the review on invitation, and did or supervised the research described in a small portion of it, here at Brookhaven National Laboratory under the auspices (then) of the US Atomic Energy Commission. Why has it been frequently cited? Probably only because reviews are more often cited —as convenient bibliographic starting points — than read. But the context in which it was written may supply a marginally more flattering reason.

"That context —the entire topic —developed mainly through the efforts, over

several decades, of Sterling B. Hendricks, retired but still active, and the late Harry A. Borthwick, at the Beltsville laboratories of the US Department of Agriculture. Of course they had co-workers, some of them excellent independent scientists in their own right. But it was basically the collaboration of these two very different men that, with meager support, through persistence, imaginative theory, and a rare sense of experimental realities, shaped a fundamental advance in biology well above the average Nobel standard. Although Stockholm never noticed —plants don't count for much there —one invokes the sacred name simply to underline the other superlatives.

"Why is this relevant to the citing of my review? Possibly because there is one aspect of the work of Borthwick and Hendricks that does *not* merit superlatives: the writing. Their papers and reviews are for the most part discouragingly condensed, indirect, and even cryptic, often at the most important points. The condition may have been contagious, for it is observable also in their immediate colleagues. So perhaps the chief value of my review was just in being one of the earliest by an outsider not similarly afflicted. The review also made clear (I hope) and explicit some of the obstacles and paradoxes encountered in initial attempts to reconcile spectrophotometric assays of phytochrome with physiological estimates of its activities. These are by no means fully resolved even now, but probably the major route to their eventual solution lies through the elegant immunochemical studies of Lee H. Pratt, now at the University of Georgia, and his students.^{1,2}

"What effects did the review have on the field, and on my own career? Well, by the early 1970s, it had become far more difficult to get any support for work on phytochrome in the US; my own funding had also been drastically reduced. At the same time, interest and support for the field in both Europe and Japan had greatly expanded. That is roughly the situation as it remains today. Don't blame me for any of it!"

1. Pratt L H. Molecular properties of phytochrome. *Photochem. Photobiol.* 27:81-105, 1978.
2. Hunt R H & Prptt L H. Phytochrome radioimmunoassay. *Plant Physiol.* 64:327-31, 1979.